Automated Generation of an On-Line Guidelines Repository

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1   Introduction

Involving User Interface (UI) guidelines is one possible way to improve usability of interactive applications either at design/programming time or at evaluation time. At design time, they can provide designers with some assistance by helping them to orient design options to obtain UIs which are more usable, more adapted, tailored to contextual needs (i.e., user population needs, physical environment constraints, and task needs). Guidelines can also serve as requirements to be achieved by developers at programming time. At evaluation time, a new UI or a previously designed one can be submitted to guidelines checking to guarantee a minimal threshold of usability.

Guidelines today exist for a wide spectrum of interactive applications ranging from general business oriented applications, such as (Smith and Mosier 1986) and (Scapin 1986) to specific UIs in control rooms, such as (O'Hara *et al.*1994), from traditional applications (MIL-STD-1472D 1989) to World-Wide-Web-based applications. Guidelines are gathered into five basic types of ergonomic sources depending on their domain of human activity, software and hardware platform, corporate environment: design rules, set of guidelines, style guides, standards, and ergonomic algorithms (Vanderdonckt, 1999). A *style guide* is a set of guidelines and/or functional or non-functional specifications aiming at consistency for a family of distinct UIs. This family can be based on an operating system (such as Windows'95), on a software editor (such as Borland's products), by a particular physical environment (such as IBM CUA), by a domain of human activity (such as medicine) or by a corporate (in-house style guide). Sev-

eral corporate environments have committed themselves to the deployment of their own style guide, called *custom style guide* in contrast to *general style guides*, for several purposes:

- to avoid catastrophically unusable UIs,
- to ensure a better consistency across the family of interactive applications they are developing, using, disseminating,
- to communicate a unique and recognizable UI look & feel that reflects the organization philosophy, products and services,
- to inform the decision of design options decided by designers at design time,
- to provide assistance to evaluators of UIs at evaluation time,
- to reduce costs at both design and evaluation time by letting people to concentrate on major potential issues rather than loosing resources on insignificant details,
- to capture the progressive experience (e.g., pitfalls, errors, trial, good choices, usable windows) that an organization can gain in designing interactive applications not only to avoid reinventing the wheel but moreover to build new interactive applications by relying on top of past experience;
- to widely disseminate this experience throughout the organization.

2   Paper-based versus on-line style guides

Style guides are essentially presented in two forms: paper-based style guides (e.g., document, internal report, technical report, handbook, reference manual) or on-line style guides (e.g., downloadable document, HTML conversion of documents, pieces of software, on-line reference manual). Examples of the second form are called "tools for working with guidelines". Advantages, depicted by a "☝" sign, and shortcomings of paper-based style guides, depicted by a "☞" sign, are reproduced in the first column of Table 1, whereas advantages and shortcomings of on-line style guides are reproduced in the second column.

Paper-based style guide	On-line style guide
☝ Easiness	☞ Difficulty
☝ Accessibility	☞ Limited accessibility
☝ Legibility	☞ Reduced legibility
☝ Timeliness	☞ Inconvenience
☝ Hardware/software independence	☞ Hardware/software dependence
☞ Important size	☝ Size independence
☞ Rigidity	☝ Flexibility
☞ Fixed level of detail	☝ Varying level of detail
☞ Static format	☝ Dynamic format
☞ Limited reusability	☝ Increased reusability

Table 1. Advantages and shortcomings of paper-based versus on-line style guides.

As observed in Table 1, the characteristics which are considered as advantages for a paper-based style guide are evaluated as shortcomings for an on-line style guide, and vice versa. Both versions are consequently seen as complementary to each other. To overcome major shortcomings of producing an on-line style guide, we developed SIERRA (Système Interactif pour l'ERgonomie de Réalisation des Applications interactives – Interactive System for Software Ergonomics of Interactive Applications), a tool for working with guidelines that automatically produces an on-line style guide from a paper-based one.

3   Automatic Generation of an On-line Style Guide

A simple comparative analysis can establish that the following set of functions is minimal for a tool for working with guidelines:

- the reading and understanding of the complete contents of a guideline;
- sequential access to a guideline, a section or a division of guidelines;
- random access to a guideline, a section or a division of guidelines;
- the reading and understanding of related concepts (e.g., ergonomic criteria);
- the link from one guideline to another related, to other associated concepts;
- the searching of guidelines by title or any information found in its contents;
- the searching of guidelines by reference, by design ergonomic criteria, by evaluation ergonomic criteria, by linguistic level);
- the comparison of two selected guidelines;
- random access to illustrations and examples of a guideline;
- annotation, printing and copy-pasting a guideline;
- gathering of guidelines in a group for report and evaluation purposes,…

The idea of automatic generation of an on-line style guide consists in automatically generating a hypermedia providing the above functions from the paper-based style guide. This document should be structured into taxonomical sections ending up with guidelines, each guideline being itself decomposed into the attributes of a general guideline model described in (Vanderdonckt 1995). To make this generation as general as possible, the document is decomposed into information units in the hypermedia. Each *information unit* is characterized by a title (e.g., « Introduction », « Good example »), a title level (e.g., « Chapter 1 », « Section 1.1 », « Sub-section 1.1.1 », « Guideline 1.1.1●1 »), and an informational content which is structured or not according to the general guideline model:

1. if the contents are structured, i.e. if the information unit consists in a single guideline, then the model definition determines the information type ;

2. if the contents are not structured, i.e. if the information unit is anything else than a guideline, then its information type should be specified in heterogeneous, text, table, list, image, sound, video, macro, application, environment.
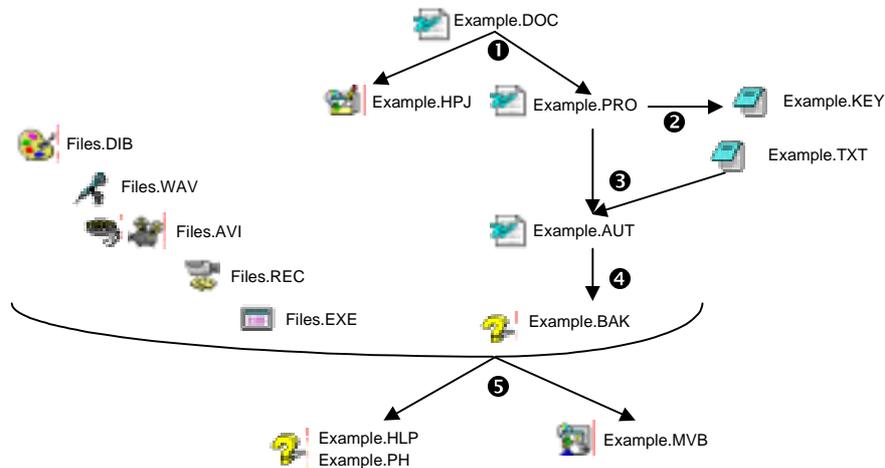
Figure 1. Process for automated generation of an on-line style guide.

Figure 1 depicts the generation process followed to automatically generate a on-line style guide from a paper-based document (Example.DOC) written in Microsoft Word. In this word processor, several WordBasic macros are executed:

- the automatic processing macro ❶ generates a first file decomposing each structured unit into sections and leaving each unstructured section as a whole with standard browsing links (Example.PRO) as well as a project definition file (Example.HPJ). This file, editable with MS Project Editor, contains the table of contents, its structure and the type of all information units;

- the keywords creation macro ❷ sorts in the Example.KEY file the alphabetical list of all words the document is containing with their occurrences in information units. Some specific significant words related to guidelines topics can be automatically added and other insignificant words can be automatically removed with additive and subtractive filters; the resulting file can be edited with any ASCII editor;

- the intra-link macro ❸ automatically generates Example.AUT with links in the hypermedia from a file containing words (e.g. [Smith & Mosier 1986], interaction style) to their definition or reference in the hypermedia (e.g., to the bibliographical reference of Smith & Mosier's document, to a definition of « interaction style »);

- the extra-link macro ❹ inserts in Example.BAK corresponding commands to access external files containing resources containing images (Files.DIB), sounds (Files.WAV), video sequences (Files.AVI), recorded macros (Files.REC), executable applications (Files.EXE), and applications that demonstrate behaviors in other environments (Files.EXE).

The resulting file can then be submitted to a manual edition of automatically inserted commands and created links ❺. MS Help Compiler V4 compiles the file Example.BAK into a hypermedia file (Example.HLP) along with a compressed access file (Example.PH) with the help of Example.HPJ project definition file.

4   Conclusion

The big win of this tool is that any change in the paper-based version can be automatically reflected into a similar change in the on-line style guide. Having the source files ready, a first generation requires an average time of 20 minutes, due to the manual operations. A re-generation of a previously generated on-line style guide takes at most 10 minutes. The proposed approach can therefore reduce the cost of producing an on-line style guide from a paper-based one, but moreover cuts time in every time the style guide is maintained.

5   References

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